U.S. Bureau of biological Survey.

WILDLIFE REVIEW

AN ABSTRACTING SERVICE FOR WILDLIFE MANAGEMENT
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UNITED STATES DEPARTMENT OF AGRICULTURE

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Control: Electric fence, value of

Gerstell, Richard. Electric fencing as a deer control agency, Pennsylvania Game News (Board of Game Commissioners, Harrisburg, Pa., 10 cents a copy), 8(12), March 1938, pp. 8-9, 32, 2 photos, 2 line cuts.

A preliminary report on experiments with electric fencing in preventing damage by deer. Spacing of the wires thus far found most effective was for the lower, 22 inches above the ground and for the upper, 15 inches higher. The wires must be entirely insulated and this was economically accomplished by the use of old inner tubes. A very high percentage of the animals make contact by nosing the wire and as a rule avoided it thereafter. The fences were better than 90 percent efficient in preventing deer from entering the experimental plots. Results of tests with bear were contradictory. Caution in the use of electric fences is urged. They are no solution of overpopulation problems.

Cycles: Arctic animals

Chitty, Dennis, and Charles Elton. Canadian arctic wild life Enquiry, 1935-36, Journ. Animal Ecology (Cambridge University Press, Fetter Lane, London, E. C. 4, England), 6(2), Nov. 1937, pp. 368-385, 4 figs., 3 tables.

Notes on cyclic fluctuations of arctic animals. Returns from a second questionnaire as to numbers and diseases of the arctic fox, lemming, snowy owl, ptarmigan, and sledge dog. Reports of increase or decrease are plotted on maps and the original data is presented also in tables. Part of the authors' summary is: "Arctic foxes showed almost universal decrease and scarcity. More than a third of the observers reported increase in lemmings: increase in snowy owls was also reported from some of the same points. The ptarmigan data are reserved for future publication. There were practically no reports of disease among sledge dogs in the Eastern Arctic, and only a few on the Western Arctic coast and islands. Disease was reported more frequently from the Great Slave Lake area and a few other points in the Mackenzie River Valley. These fluctuations are a vital factor in the economy of the Canadian Arctic, since they affect the fur trade, food supply, and dog transport. The enquiry is being continued."

Bibliography of 14 titles.

Cycles: Cottontail

Leopold, Aldo, and Harry G. Anderson. The 1936 cottontail scarcity in Wisconsin, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), February 1938, pp. 110-111.

Evidence is given that cottontails after a productive spring breeding season decreased during a hot and dry summer, the degree of reduction differing by regions of the State. The onset of the shortage was just 8 years after the last similar phenomenon. The fluctuation may be regarded as "the cycle" but to so label it adds nothing to our understanding of its nature.

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Cycles: Hungarian partridge

Rowan, William. The Hungarian partridge on the Canadian prairies, Outdoor America (1167 Merchandise Mart, Chicago, Ill., 10 cents a copy), 3(4), Feb. 1938, pp. 6-7, 1 fig.

History of introduction and spread; the bird seems to [illegible] population cycle coincident with that of rabbits and grouse.

Destruction: Desert bighorn

Nichol, A. A. Desert bighorn sheep, Arizona Wildlife Magazine (32 W. Jefferson St., Phoenix, Ariz., 25 cents a copy), 7(7), Nov.-Dec. 1937, pp. 9, 16, 1 photo; 7(8), Jan-Feb. 1938, pp. 3, 12, 1 photo.

The desert bighorn appears now to be at an all time low ebb in population. "The three major factors that at present are operating to the detriment of the species are poaching, roads, and drought, and the greatest of these is poaching." Amateur prospectors wantonly shoot the animals at watering places, often making no use whatever of the carcass. Roads bring in more people and so increase the killing of the sheep. Drought has operated inimically by forcing the animals into new areas and especially by making them dependent upon a reduced number of water holes where they are readily shot. [End of Part 1.]

Notes on feeds and their availability in dry periods. Dry years curtail breeding and, added to other inimical factors, retard recovery of numbers. Predation, while not a serious hazard under normal conditions, may be more important in relation to a depleted population. The presence of great herds of wild burros has favored increase in mountain lions which take toll also of the sheep. The burro herds should be extirpated and the lions reduced. Some predator control especially designed to aid the sheep may be required but the first necessity is to stop poaching. Author's recommendation: "Develop supplementary water, and stop water-hole hunting, and the sheep will again increase. This sounds a simple and cheerful statement. What needs to be done is simple, and it is fine and advantageous that it is so; but what is not cheerful is the so very important truth that if these remedies are not quickly administered, there will be left no desert Bighorn sheep to receive the treatment."

Destruction: Effects of insecticides

Swenk, Myron. Bird mortality in the 1936 Nebraska grasshopper poisoning campaign, Nebraska Bird Review (1410 North 37th St., Lincoln, Nebr.), 4, 1936, pp. 98-99.

Tabulation of reports from county agents, only 15 of which are of possible value as indicating poisoning. In 3 of the 15 counties represented by these reports "there was no loss except where bait had been improperly used regardless of the instructions given. In one a domestic pigeon was thought to have

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been killed through feeding on bait, and in another several domestic geese were reported to have been similarly killed. Two instances of supposed poisoning of wild birds were reported from one county, a few cases each from two other counties, and several cases from a third county. A few dead birds were reported found in four counties, about a dozen in another county and an indefinite larger number in a sixth county. But in no case was it definitely shown that birds died of poisoning, and not of heat and thirst."

Diseases and Parasites: Ectoparasites in relation to bird diseases

Herman, Carlton M. Ectoparasites and bird diseases, Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 7(4), Oct. 1936, pp. 163-166.

Diseases caused by Plasmodium, Haemoproteus, Leucocytozoon, Heptazoon, Pasteurella, etc., and their known or probable vectors. Direct injuries by Protocalliphora and mites with suggestions as to possibilities of control.

Diseases and Parasites: Hippoboscid flies

Herman, Carlton M. Notes on hippoboscid flies, Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 8(4), Oct. 1937, pp. 161-166.

Four species collected on Cape Cod, Mass., with lists of their bird hosts, notes on abundance, role in carrying Mallophaga, and upon mites found on the flies.

Diseases and Parasites: Minnesota investigations

Green, R. G. et al. Minnesota Wildlife Disease Investigations (Department of Bacteriology, University of Minnesota, Minneapolis), Oct.-Nov. 1937, pp. 141-168, tables 78-99.

An article on Tick Parasites reviews the literature (5 titles cited), gives distribution in Minnesota, percentage of parasitism (average 7.4) attained, and numbers of the parasites (3-10) emerging from hosts. Summary of a report on The Occurrence of Shock Disease among Young Snowshoe Hares is: Shock disease as we have observed it, develops in areas highly populated by hares. The young are readily affected, succumbing at an average age of 6.5 weeks. Reports are given of autopsies on quail affected by blackhead, wild ducks, pheasants, and muskrats with various maladies, and on snowshoe hares collected in the Lake Alexander study area. Experimental pen and range studies with hares are analyzed. Improvements in census calculations are discussed mathematically and the conclusion drawn that all of the work so far has been free from significant error. A summary of population statistics of 1932-37 shows that the die-off does not appear suddenly and does not complete its destruction in a short time--even in a year. On the contrary, in the study area it proceeded at a fairly regular rate through a period of 5 years. The die-off may begin also on one area several years before an adjacent area is involved. There are brief articles on reproduction in snowshoe hares, and on the occurrence of lead poisoning in nature.

Diseases and Parasites: Persimmon wilt

Detwiler, S. B. The soil-saving persimmon, Soil Conservation (Supt. of Documents, Washington, D. C., 10 cents a copy), 3(8), Feb. 1938, pp. 230-231, 2 photos.

The value of the wood and fruit of the tree is estimated at 16 million dollars annually; there is also a large unestimated value in erosion control. The persimmon, widely utilized by wildlife, is now menaced by a deadly wilt disease. The present paper is one move and others are being taken to bring about proper investigation, and if possible control, of the disease.

Diseases and Parasites: Protocalliphora

Mason, Edwin A. Parasitism of birds' nests by Protocalliphora at Groton, Massachusetts, Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 7(3), July 1936, pp. 112-121, 2 tables.

Notes on number of these dipterous parasites found in 24 nests in 1932 and summaries for the years 1932-35. Discussion of a few case histories, of the value of changing the nest as a means of getting rid of the parasites, and of favoring the population of chalcidid hyperparasites as a method of control. Conclusions are rather pessimistic, more so than seems warranted by observations of the abstracter on about the same complex in Maryland.

Ecology: Food supplies of pheasant appraised

Errington, Paul L. Quality of winter pheasant foods, Game Breeder and Sportsman (205 E. 42nd St., New York, N. Y., 25 cents a copy), 41(11), Nov. 1937, pp. 202-203.

Popular resume of his paper "Emergency values of some winter pheasant foods" abstracted in WILDLIFE REVIEW, No. 11, February 1938, pp. 33-34.

Ecology: Forests and wildlife

Deem, J. L. Forest practices affecting wildlife, Pennsylvania Game News (Board of Game Commissioners, Harrisburg, Pa., 10 cents a copy) 8(12), March 1938, pp. 12-13, 1 photo.

A good brief discussion of forest wildlife relationships, telling what seems certainly known, what is questionable, and what should be found out.

Ecology: Populations

Bureau of Animal Population (Oxford University, England) Annual Report 1936-37, 38 pp., 1938.

Summary of world work of the year on animal populations. "The year under review has seen a general development of interest in animal population problems in many parts of the world, accompanied by useful technical discoveries, but without any very striking contribution of abstract ideas." Dis-

cussion of the relation of animal population phenomena to mankind. Statement of financial support, and list of the staff, of the Bureau. Recapitulation of its research work of the year on voles, rabbits, and hares, introduced mammals, partridges and other game birds, and ecological surveys, publications on which have mostly been abstracted in previous issues of WILDLIFE REVIEW. List of papers by members of the staff published during the year and comment on library facilities and work.

Ecology: Populations, brant in California

Moffitt, James. Seventh annual black brant census in California, Calif. Fish and Game (Ferry Bldg., San Francisco, Calif.), 23(4), Oct. 1937, pp. 290-295, 1 table.

About the same material as abstracted in WILDLIFE REVIEW, No. 11, February 1938, page 13; with notes on the 1936-37 flight, summary of the records, and the suggestion that before we can properly interpret numerical fluctuations of brant in the north, we will have to know a great deal more of the occurrence of the birds in Lower California.

Ecology: Populations, European partridge

Middleton, A. D. The population of partridges (Perdix perdix) in Great Britain during 1936, Journ. Animal Ecology (Cambridge University Press, Fetter Lane, London, E. C. 4, England), 6(2), Nov. 1937, pp. 318-321, 3 tables.

Continuation of reports already noticed in WILDLIFE REVIEW, No. 1, September 1935, page 12, No. 3, April 1936, page 13, and No. 8, April 1937, page 11. Density was high (up to 663 nests actually found on 3,000 acres) but due to unfavorable weather, brood survival was low. The kill in consequence was lower than in the preceding year. All of these things are recorded in detail in the tables.

Economics: Value of fur, Wisconsin

Anon. Million dollar trapping income, Wisconsin Conservation Bul. (State Dept. of Conservation, Madison), 3(2), Feb., 1938, p. 33.

Number of skins, average price, and total value of the catch of 17 groups of mammals for the 1936-37 season. The muskrat leads in numbers (362,371) and in aggregate value ($521,814), while otter and beaver brought the highest average prices, $15.62 and $13.86, respectively. Totals are: numbers 1,324,533, and value $1,080,348.

Education: Conservation through 4-H Clubs

Lohmann, Ruth. Teaching conservation of wildlife through 4-H Clubs, U. S. Dept. Agr. Miscellaneous Pub. (Supt. of Documents, Washington, D. C., 10 cents a copy) 291, 34 pp., 4 figs., 1938.

Present status of wildlife; need for conservation; opportunities for teaching conservation through 4-H Clubs; wildlife objectives of the Clubs; suggested conservation practices for the members; wildlife conservation in the 4-H program in 1934 and 1935; setting up a program; conservation as a project; means and agencies for use in teaching; typical programs for a year; community clubs; literature cited (15 titles); selected bibliographies relative to conservation, nature trail, birds, mammals, and other nature subjects.

Food Habits: European partridges

Middleton, A. D., and Helen Chitty. The food of adult partridges, Perdix perdix and Alectoris rufa in Great Britain, Journ. Animal Ecology (Cambridge University Press, Fetter Lane, London, E. C. 4, England), 6(2), Nov. 1937, pp. 322-336, pls. 9-10, 1 fig., 3 tables.

Analyses of crop contents only, the volumes of components of which were for the most part actually measured. Partridge habitat and seasonal changes in it are described; the environment for most of the birds collected was farming land with a great diversity of crops. The proportions of classes of food of the grey partridge (429 crops) by seasons are shown in table and graph. The leading items are grass, clover, and leaves, 42.2 percent; grain, 21.2; and grass and weed seeds, 20.8. Figures as to number, frequency, and bulk are given also for the species identified. Animal food, chiefly insects, constituting only 2.5 percent of the food of the year, is listed; ants are the most important element by bulk, about eight-tenths of the whole.

Results are given on a pen-feeding test as to the quantity of food consumed; the average, exclusive of grass and other leaves that may have been picked in the pen, for 66 bird-days was 23.7 grams. Data are presented on the food of 29 red-legged partridges; they reveal the important items as seeds 28.4 percent, roots 28.2, grain 27.3, and greens 16. Suggestions for management are given, particularly as to improvement of the winter food supply. Bibliography of 7 titles, 4 of them Usonian.

Food Habits: Pheasant

Severin, H. C. A summary of an economic study of the food of the ringneck pheasant in South Dakota, Proc. S. Dak. Acad. Sci. (University of South Dakota, Vermillion, S. Dak.), 16, 1936, pp. 44-58, tables.

This species, introduced into the State in 1912, so increased that a million birds have been harvested by gunners during each hunting season since 1927. The large population brought the economic status of the pheasant to public attention and an investigation was made to throw light on contending claims. Analysis of the contents of 285 crops and gizzards is reported by a numerical system. Seeds taken averaged 492 per bird and of the total 25.7% were reckoned as useful to man, 34.8% neutral, and 39% harmful. Corn, the most important single food, is eaten at all seasons but much of it is waste. Serious damage to the corn crop was not observed. The animal food of the birds was 97% insects by number. On the same basis, 40% of the food items of animal origin were classed as harmful to man, 3% useful, and 30% doubtful. Fly

larvae, cutworms, and beetles were prominent, while grasshoppers were taken less frequently than expected. The pheasant probably does as much good as harm through its feeding habits in South Dakota.

This paper is a digest of an extensive report not publicized at the time of issue for the reason that it was published in a strictly limited edition; copies were deposited, however, in numerous libraries. That paper entitled, "An economic study of the food of the ring-necked pheasant in South Dakota," was issued in mimeographed form in 1933. It comprised 252 pages, including numerous figures and tables, and besides general discussion, presents detailed analyses of the crop and gizzard contents of 504 pheasants.

Food Habits: Ruffed grouse

Gross, Alfred O. Food of the ruffed grouse, Game Breeder and Sportsman (205 E. 42nd St., New York, N. Y., 25 cents a copy), 41(8), Aug. 1937, pp. 142-144, 2 figs., 2 tables.

Summary of results of analyses by the Biological Survey of 1,055 crop and stomach contents collected in connection with the New England Ruffed Grouse Investigation. The tables give the frequency of occurrence and average percentage by bulk of long lists of vegetable and animal food items. The more important foods of the first class according to volume were derived from oak (chiefly acorns), thorn apple, apple, Maianthemum, blackberry, and poplar; and in the second, from grasshoppers. Vegetable matter constituted 98.57 percent of the total food.

Food Habits: Sea otter

Williams, Cecil S. Notes on food of the sea otter, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), Feb. 1938, pp. 105-107, 2 tables.

Two thousand probably a liberal estimate of the existing North American sea otter population. The animals frequent isolated kelp beds. From study of droppings the important foods were found to be sea urchins and mollusks. Other food items and incidental objects are mentioned, and the results of the investigation compared with those of a study made in the Commander Islands.

Introductions: Gray squirrel, Great Britain

Parsons, B. T., and A. D. Middleton. The distribution of the grey squirrel (Sciurus carolinensis) in Great Britain in 1937, Journ. Animal Ecology (Cambridge University Press, Fetter Lane, London, E. C. 4, England), 6(2), Nov. 1937, pp. 286-290, 1 map, 3 tables.

The range of the animal continues to increase. Figures are given for the annual kill on 4 estates from 1932 to 1937; the largest record for each is: 450, 1,059, 1,427, 1,125, 936.

Life Histories: Black-tailed deer

Orr, Robert T. Notes on the deer of California Redwood State Park, Calif. Fish and Game (Ferry Bldg., San Francisco, Calif.), 23(4), Oct. 1937, pp. 286-289, figs. 79-80 (photos).

This area of about 10,000 acres has a minimum population of black-tailed deer of one to 40 acres. Important foods are canyon oak, California lilac, buckbrush, salal, huckleberry, madrone, and grasses. Eighty percent of the does bear young, twins in from 20 to 30 percent of the cases. Competition between deer and raccoons. Notes on good and bad effects of artificial feeding.

Life Histories: Blue-winged teal

Bennett, Logan J. The blue-winged teal, its ecology and management, xiv+144 pp., 1 col. pl., 19 vignettes, 31 photos, 6 maps, 33 tables, 1938 (Collegiate Press, Inc., State College, Ames, Iowa, $1.50 a copy).

An attractive and well-made book embodying results from the author's survey of the literature (71 titles cited) and from field work extending from 1932 to 1937. In earlier stages, the work was an Iowa cooperative undertaking; later it became the main project of the Federal-State cooperative unit for Iowa. The field work while done mainly in that State was extended in a less intensive way to the northern great plains region and to Mexico. The publication of so much original observation is a distinct contribution to a great need of wildlife management, namely for definitive life histories; every one adequately done constitutes a permanent advance in the field.

It is impossible to present in this abstract the essence of the book, witness Bennett's summary with 84 paragraphs. Suffice it to say that the biology and ecology of the bird are covered very comprehensively. Chapter headings indicating this fact are: Characteristics of the bird, Breeding range, Fall migration, Wintering grounds, Spring migration, Courtship and mating, Nesting, Rearing of young, Nest destruction and juvenile mortality, Nesting cover, Rearing cover, Food habits, Nesting populations, Parasites and disease, Agriculture and drainage, Breeding, refuge, and shooting areas, Estimating the yearly production, Future of the blue-winged teal.

Points of theoretical interest: Conflicts with coots harmless and apparently settling no question; there were no territorial disputes by either males or females; motherless young assimilated into other broods without any difficulty.

The book is a bargain at $1.50 as publication was subsidized to the extent of a third of the total cost.

Life Histories: Mountain sheep, Yellowstone Park

Davis, William B. Summer activity of mountain sheep on Mt. Washburn, Yellowstone National Park, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), Feb. 1938, pp. 88-94, 3 tables.

Information on daily activity, beds, voice, food, chewing the cud, molt, parasites, home range, and fate of lambs. Measured by time spent in grazing on them, grasses, Pedicularis, and Phacelia were the most important foods in July. Daily cruising radius as much as 1 or 1-1/2 miles; average 3/4 mile. Mortality of lambs, mostly occurring during the first winter, exceeds 50 percent; no predators were seen.

Life Histories: Wolf

Olson, Sigurd F. Organization and range of the pack, Ecology (Prince and Lemon Sts., Lancaster, Pa., $1.25 a copy), 19(1), Jan. 1938, pp. 168-170, 2 figs.

Wolf packs in northeastern Minnesota vary in number from 5 to 30 individuals. The packs range over well established circuits that may be from 30 to 50 miles in diameter and up to several hundred miles in total length.

Life Histories: Wood rat

Vestal, Elden H. Biotic relations of the wood rat (Neotoma fuscipes) in the Berkeley Hills, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), Feb. 1938, pp. 1-36. 4 figs., 3 tables.

Description of habitat and account of observations under numerous headings of which those relating to scatology, houses, breeding habits, food habits, enemies, and parasites probably are of most immediate interest to the wildlife manager. A list of 25 species of plant foods is given. Part of the author's summary is:

"An average of 20.7 adults per acre was found at the beginning of the breeding season in one favorable area of about 25 acres. The breeding season coincides roughly with the period of maximum plant growth in the habitat. It begins about March 4 and most young are born in early April, although some are born as late as the latter half of August. One litter per season is the rule. Average and extreme numbers of young in 18 litters were 2.6 (1-4). Wood rats appear to be polygamous. Foods eaten by the wood rat include herbage and fruits of trees, shrubs, bushes, herbs, and grasses. A daily supply of green food enables wood rats to dispense with free water. They store green food each day within reach of the nest. In autumn they store also nuts, acorns, seeds, and berries, which are used in winter. Wood rats do not hibernate. The forage range of a wood rat averages less than 100 feet in radius from the nest. In some places, where numerous, the animals damage trees by over-pruning. Enemies of wood rats are: bobcats, horned owls, men, weasels, barn owls, and dogs, important in the order named. Wood rats are externally parasitized by fleas, cone-noses, bot-warbles, ear mites, and ticks. Human activities of clearing and burning of underbrush and trimming out of trees eliminate wood rats. As a result of the killing of many bobcats in Wildcat Canyon the wood rats have increased there."

Management: Bobwhite

Stoddard, Herbert L. Sixth Annual Report Cooperative Quail Study Association (Thomasville, Ga.), 1936-37, 27 pp., 1938.

General statement of the work of the Association including that done in cooperation, with lists of cooperators and visitors to headquarters. Comment is made upon numerous subjects including, as in previous reports, the use of fire; attention is drawn to danger to the Association's program in the legislative proposals of fire exclusionists. The relation to game preserves of the paper industry now rapidly developing in the Southeast is discussed; "the trend will probably be in favor of deer and adverse to quail on the acreages owned for paper pulp production." Experiments with various plants of promise in wildlife management, their cultivation, and fertilization are reported upon. There is a section on trial of electric fence and another on reclaiming pastured lands for quail. Progress in the mammal studies of E. V. Komarek and of the fire ant investigations by Bernard V. Travis of the U. S. Bureau of Entomology and Plant Quarantine also is summarized.

Management: Bobwhite, Missouri

Terrill, Harold V. Requirements for quail in Missouri, State Conservation Commission (Jefferson City, Mo.), 6 pp., 2 maps, mimeographed, 1938.

The more important needs as to cover, food, and water, and suggestions as to how they may be met on the farm. Accompanying explanatory text are maps illustrating a farm unsuitable for quail and changes that can be made to improve it. The whole release is cast in the form of a letter to cooperators.

Management: Bobwhite, value of refuges

Claycomb, G. B. A solution for the quail problem, Louisiana Conservation Review (State Dept. of Conservation, 126 Civil Courts Bldg., New Orleans, La.), Winter 1937-8, pp. 43-44.

Alarming decline in the quail population has resulted from intensive cultivation, erosion, and depredations of roaming cats and dogs, but "unrestricted hunting has been the greatest evil." Hunting must be better regulated and one way of doing this is establishment of Protection Areas where the birds are not merely protected but also fed. The author cites the increase of quail on a refuge he has kept for 3 years and points out that "Such tracts have been maintained in a way by farmers who have posted their land. These farmers have been cursed and maligned by hunters in general, while as a matter of fact they have incidentally been about the best friends that hunting has ever had. Upon these posted lands the quail have been able to maintain themselves and serve as a supply reservoir for the surrounding lands. We need a considerable part of our land in Protection Areas. If half of our land were so protected, hunting would be twice as good on the remaining half." Noting that the cost of propagated quail is a dollar or more per bird, the author goes on to say that "The rearing of hatchery raised Quail during the summer to be shot by hunters in the fall cannot be economically justified. The only

legitimate reason for rearing Quail artificially is that they may become potential breeders when released. Now the logical place for the release of these hatchery reared Quail is upon the already established Protection Areas where they will find conditions suitable for their breeding activities."

Management: Farm game

Tubbs, Farley. Farm crops versus game, Michigan Conservation (State Dept. of Conservation, State Office Bldg., Lansing, Mich.), 7(6), Feb. 1938, pp. 6-7, 3 photos.

Intensive and exploitive farming are both injurious to wildlife; areas subjected to the former practice can best be improved by restoration of cover and to the latter by renewal of fertility. The value of prompt and regular manure spreading, of fertilization and rotation of pastures, and of preserving ground cover in wood lots is emphasized.

Management: Farmer-sportsman relationship

McCachran, R. A. The farm-game refuge program wins, Pennsylvania Game News (Board of Game Commissioners, Harrisburg, Pa., 10 cents a copy), 8(12), March 1938, pp. 4-5, 29, 2 photos.

Summation by 17 topics of answers to a questionnaire directed to both farmers and sportsmen that constitutes an overwhelming indorsement of the plan to date. Information on acre-costs of 5 phases of the projects also is included.

Management: Forest wildlife

Bode, I. T. The extension forester and wildlife conservation, Journ. Forestry (Mills Bldg., Washington, D. C., 50 cents a copy), 36(3), March 1938, pp. 283-287.

Analysis of the job of an extension biologist as applied to forestry. The wide and deep public interest in wildlife indicates that it is an essential land resource, the demand for which is increasing, and apparently never will be over-supplied. In extension work under present conditions the writer believes that logical approach to the educational program involves: "(a) The placing of primary emphasis at this time on the esthetic, recreational, social, and indirect economical values; (b) Approaching primary or directly economical values, for the time being, on the basis of trial and careful procedure; avoiding premature promises of primary economic returns and possibilities; (c) Planning all approach on the basis of integration with other land use practices, acknowledging the wildlife resource as only a part of the entire picture of land use."

Wildlife utilization is an integral part of land use. There must be a harmonizing of views of the holders of land on which wildlife is produced and of the people who want to use this resource. A step toward this end is the incorporation of wildlife planning in farming, pasturing, forestry, erosion

control, and other land use activities. Forests do not automatically and inevitably produce a satisfactory wildlife crop; they must be managed to that end. There are barren areas not suited to production of tree crops that can well be devoted to wildlife. Woodland margins do not produce the best timber trees but they are excellent for, and may well be allocated to, wildlife--an objective that may be effected in part by sparing them from stand improvement treatment. Some nut and den trees can be left in the forest with very little damage to the ultimate product. Research is needed as to the best combination uses of forest lands.

Management: Forest wildlife

Shantz, H. L. Recent developments in wildlife management, Journ. Forestry (Mills Bldg., Washington,D. C., 50 cents a copy), 36(2), Feb. 1938, pp. 149-151.

"The physical environment, the biological inter-relationships, the social and economic interests, divided legal authority, and the conflict of various interests" make the management of wildlife on national forests a very complicated problem. About a fourth of this paper is devoted to fish management. Beyond that, overpopulations of ruminants and the possibilities controlling them are the principal subjects discussed, although there is some reference to beavers, waterfowl, upland game birds, and rare species.

Management: Harvesting coon and possum, Illinois

Mohr, Carl O. Illinois trappers' averages reveal coon and possum distribution, Illinois Conservation (State Dept. of Conservation, Springfield, Ill.), 2(4), Fall 1937, pp. 3-4, 8, 1 fig., 3 maps.

The average catch in the most favored counties was 4 coons and 16 possums per trapper. Distribution of the catch is mapped and discussed. Recommendations for better protection of coons, including preservation of den trees.

Management: Harvesting squirrels

Chapman, Floyd B. Controlled squirrel hunting on Ohio hunting preserves, 1937, Ohio Wildlife Research Station (Ohio State University, Columbus, Ohio), Release 68, 8 pp., 10 tables, mimeographed, Jan. 1938.

Reports for previous years were abstracted in WILDLIFE REVIEW, No. 4, June 1936, page 15, No. 5, Sept. 1936, page 19, and No. 9, July 1937, pages 26-27. There is a definition of classes, and a list, of State refuges and sanctuaries, showing type, location and acreage. The gray squirrel population appears to be cyclic, the low being reached in 1937 in most of southern Ohio. The harvest by hunters is tabulated in various ways and compared with that of 1935 and 1936. Hunting pressure has been proportional to publicity and the conclusion is drawn that "regulated publicity can be used to attract approximately the number of hunters required to harvest a given surplus."

Out of 324 hunters, 257 got no squirrels, and on the average hunters spent 11.6 hours in the field for each squirrel bagged. [Scarcity evidently protects the animals but under discretionary regulation of open seasons, it would seem that no shooting should be allowed during the low of a cycle.] Statistics are given for weights by age classes and sexes, and on sex ratio. This has varied through the years from 39.3 to 60.0 percent males, but the variation has not been correlated numerically with either the total population or the take. The physical condition of the squirrels and the prevalence of parasites in them are reported upon. Food items identified were hickory nuts, acorns, and dogwood berries. Pelage changes are described.

Management: Harvesting whales

Hjort, Johan. The story of whaling, Scientific Monthly (Lancaster, Pa., 50 cents a copy), July 1937, pp. 19-34, 14 figs. (photos), 2 graphs.

The first satisfactory grouping of whales was based on their food habits. The Danish scientist Eschricht in 1846 distinguished four biological groups, namely, "those which lived on fish, on warm-blooded animals, on crustacea of many kinds and sizes, and lastly on cuttlefish." Details are given including the scientific names of these food items and the influence their occurrence and abundance has upon the movements of whales. The history of whaling is briefed according to stages in technique. In each there was "the same course of events: a rapid expansion x x x from a starting point to the whole area of distribution of the species and then a rather rapid decline or cessation of the specific whaling activities." Nowhere has whaling succeeded in maintaining a stable industry. The Norwegian whalers have taken some steps toward regulation but international action has been difficult to obtain. See WILDLIFE REVIEW, No. 10, October 1937, page 30, as to a treaty indicative of an improvement in the international situation. The article contains much of interest about whales and is well illustrated.

Management: Miscellaneous

Anon. Wildlife management in North Carolina (Division of Game and Inland Fisheries, Raleigh, N. C.), 15 pp., 3 figs. (photos), Feb. 1938.

Discussion of environmental improvement versus restocking as means of maintaining quail populations; value of poke seeds as quail food; use of lespedezas for gully control and wildlife conservation; maintaining cover by trimming ditch banks one side at a time in alternate years; shrubs for wildlife and farmstead beautification; and the stray cat problem.

Management: Planting for quail, Virginia

Handley, Charles O. Winter and the bobwhite, American Wildlife (Investment Bldg., Washington, D. C., 25 cents a copy), 27(1), Jan.-Feb. 1938, p. 25.

"A well-fed quail fears neither subzero nor natural enemies." Comment on natural foods and feed patch plants valuable in Virginia.

Management: Planting for wildlife

Leffelman, L. J. Better land use for the piedmont, U. S. Dept. Agr. Land Policy Circular (Bureau of Agricultural Economics, Washington, D. C.), Feb. 1938, pp. 12-15, mimeographed.

Account of the Clemson College land utilization project on a 23,000 acre tract no longer suitable for arable farming. There is a section on wildlife restoration from which the following is quoted: "Planting of game feed and cover crops plays a part in the erosion control work undertaken on the project. Strip plantings of feed crops include lespedeza, peas, sagrain, hegari, sesbania, sumac, beggarweed, and millet. These feed supplies have doubtless contributed to the increase in quail already noted. Where one bird to every 52 acres was counted two years ago, there are five birds now."

Managment: Range

Talbot, M. W. Indicators of southwestern range conditions, U. S. Dept. Agr. Farmers' Bul. (Supt. of Documents, Washington, D. C., 10 cents a copy), 1782, 34 pp., 36 figs. (photos), Dec. 1937 (1938).

This bulletin contains only a brief paragraph on range-destroying rodents and one other incidental mention of wildlife, but reference to it may be helpful to wildlife managers whose duties include range appraisal. Sample headings indicating the contents are: Signs of a deteriorating range, Why ranges deteriorate, Indications of satisfactory use, Key areas, and Tips on estimating grazing capacity.

Management: Waterfowl in California

Linsdale, Jean M. Observations on waterbirds in California, Calif. Fish and Game (Ferry Bldg., San Francisco, Calif., 25 cents a copy), 24(1), Jan. 1938, pp. 1-43, 9 photos, 5 tables.

Report on a study mainly confined to the central valley of California, ecological conditions in which are discussed with special reference to their bearing on waterfowl. Shooting grounds, commercial, private, and public, and refuges, State and Federal, are described in their relation to wild fowl. In general the water birds of California have greatly decreased in number; the present status of 26 species is indicated. Shooting practices, protective regulations, relation of water birds to agriculture, and the diseases of waterfowl also are briefly treated. There is a bibliography of 14 titles. The author's summary is here quoted in full.

"Availability of water is an acute problem for certain birds in California just as it is for people. Moreover, the aquatic habitat is remarkably complex, and it must be studied from many angles if it is to be maintained for adequate use by wild animals. The present study was undertaken to determine what areas are available for waterbirds and to study the effects of shooting practices. It seems that permanent solution of waterfowl problems

in California will require management of all the aquatic animals in order to satisfy all man's recreational needs and not alone his desire to shoot. The main problem regarding waterbirds seems to be what to do about restoration of numbers sufficient to preserve the species which have been so far depleted as to be in danger of extinction; it is not simply to provide birds of any sort to be killed.

"The former extensive marshy areas in the central part of the State were so reduced by 1936 that by the time the wintering birds arrived there was no water available except where the ground had been flooded for the birds. These places were mainly shooting grounds and refuges. Refuges are likely to be the most important devices for permanent preservation of waterbirds in California. They serve as sanctuary, as nesting places, as resting places, and as feeding places. A satisfactory refuge program would permit no grazing, no harvesting and no burning. It would be desirable to delay sedimentation in ponds as long as possible and to keep them filled with water as continuously as possible.

"Examination of several of the refuges already established revealed qualities especially suited to the birds and showed the nature of some possible improvements. More refuges need to be established if the State expects to have more wintering waterbirds.

"The total number of waterfowl shooters is not exactly known, but hunting stamp sales might indicate that around 40,000 persons shoot at these birds each season in California. Apparently this is too great a number to allow continued existence of all the kinds of waterbirds. It is probable that more drastic regulations of shooting will be necessary than any in force in past years. Moreover, it seems certain that neither improvement of habitat nor stricter regulation of shooting, even prohibition of it, would solve the waterfowl problem satisfactorily. The final solution must be some combination of these. Also we must accept the general condition which makes it impossible not to have anywhere nearly as many waterfowl in California as were present when the country was settled by the white man."

Pollution problems in California

Shaw, Paul A., and C. L. Towers. Water pollution problems in California, Calif. Fish and Game (Ferry Bldg., San Francisco, Calif., 25 cents a copy), 23(4), Oct. 1937, pp. 262-285, figs. 45-75 (mostly photos).

If this article had been available, the abstract in WILDLIFE REVIEW, No. 11, February 1938, page 31, would not have been prepared. The present reference is to the unabridged report, which with its information and copious illustration, makes an impressive showing as to the evils of pollution in California. Laws and regulations and the methods of enforcing them, and protective devices are treated. The menace of oil, especially oil sumps, to birds is depicted in text and photographs.

Predation

Lloyd, Hoyes. Predators help save game, Michigan Conservation (State Dept. of Conservation, State Office Bldg., Lansing, Mich.), 7(5), Jan. 1938, pp. 6-7, 2 photos.

Predation is normal, not exceptional, and when man disturbs the normal relationships between animals, he starts a chain of events the results of which cannot be foretold. Instances of deterioration of big game populations due to freedom from predation. Results of indiscriminate killing of hawks. "Except for direct defense of domestic stock, the attitude of the public towards predators is based generally upon prejudice and lack of knowledge, and it is the duty of those who have studied the problem, even though they have not fathomed all its intricacies, to give to the public the benefit of the knowledge gained in the hope that a saner and more philosophical view will be accepted as more is learned of the facts presented by the biologists who are wrestling with the problem."

Propagation: Brooders and rearing pens for game birds

Bade, August. Sportsmen build your own brooders, California Conservationist (State Dept. of Natural Resources, Sacramento, Calif., 15 cents a copy), 3(2), Feb. 1938, pp. 6-9, 4 photos, figs.

"The capacity of a game bird brooder should not be determined by the size of the hover, but by the amount of run, or exercise space" which should be a square foot per bird. A temperature of 95° directly under the heating element is quite sufficient. Description of brooder and run, and of rearing pens, as well as plans for their construction. Suggestions as to the general care and feeding of the growing birds. As the birds develop they need more room and cannot be crowded without bad results. "Generally speaking, young pheasants and partridges require 30 square feet of ground space, and matured birds, 50 square feet. Quail can get along on about 20 square feet. In all cases, however, the more elbow room the birds have the better they get along."

Propagation: Irradiation results, bobwhite

Bissonnette, Thomas H., and Albert G. Csech. Night lighting with bob-white, Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 7(4), Oct. 1936, pp. 168-170.

Author's summary: "Increasing the daily period of exposure to light between December 16th and June 19th up to five hours per night with electric light from a 60-watt bulb induced a pair of Quail to begin to lay fertile hatchable eggs from March 22d onward. Controls began to lay at the usual time on May 19th. Total egg production was not increased as it was with Pheasants, but the hen died prematurely on June 19th. This method may be used to obtain early chicks from Quail for restocking depleted game preserves."

Propagation: Irradiation results, pheasant

Bissonnette, Thomas H. Fertile eggs from pheasants in January by "night-lighting," Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 7(3), July 1936, pp. 108-111.

Report in greater detail of the material noted in WILDLIFE REVIEW, No. 4, June 1936, page 19. Review of literature and ample bibliography. Part of author's summary: "(1) A method is described by which it has been possible to induce Pheasants to begin laying between January 15th and 25th, so that young birds may be hatched early enough to allow them to develop mature plumage well in advance of the opening of the season for legal shooting of these birds in Connecticut. (2) The fertility of the eggs laid under these conditions was satisfactory, and hatchability was good in those set under hens."

Propagation: Ruffed grouse

Elmore, L. J. Fertility of ruffed grouse, Game Breeder and Sportsman (205 E. 42nd St., New York, N. Y., 25 cents a copy), 41(9), Sept. 1937, pp. 160, 168, 1 table; and 41(10), Oct. 1937, pp. 176, 185-186, 1 chart, 1 table.

The sexual cycle and behavior characteristic of its phases are described; tests of the reactions of males to a mounted bird were made to determine what stage they had reached in the cycle. Indications of readiness to mate were borne out by good fertility of eggs upon actual pairing. Older cocks gave better fertility than yearlings, and those hatched from wild eggs were superior to cocks hatched from eggs laid in captivity. Activity in sexual display does not seem to be correlated with fertility, but mating is preceded by a test of dominance. Change in phase of the sexual cycle of the cock may occur even in the constant presence of females. Fertile egg production was as good or better in polygamous (1 to 6) as in monogamous matings.

Propagation: Wild turkey standards

Randall, Willet. Results of my wild turkey survey, Game Breeder and Sportsman (205 E. 42nd St., New York, N. Y., 25 cents a copy), 41(10), Oct. 1937, pp. 174-175, 184, 2 photos.

In praise of the turkeys of lowland South Carolina; discussion of their habits and "points" under the heading of color, wings, legs, and nest.

Research: Live shipment of small mammals

Blossom, Philip M. A screen wire container for the shipment of live small mammals, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), Feb. 1938, pp. 85-88, 2 figs.

A home-made container for packing in a carton; construction and use.

Research: Live trapping and shipment of voles

Chitty, Dennis. Live trapping and transport of voles in Great Britain, Journ. Mammalogy (Wm. H. Burt, University Museum, Ann Arbor, Mich., $1.00 a copy), 19(1), Feb. 1938, pp. 65-70, 2 figs.

Review of previous work, and account of British experience in devising traps and shipping cages that can be used with minimum losses of the animals. Figures give plans for the trap. Bibliography of 6 titles.

Research: Trapping birds of prey

Imler, Ralph H. Methods of taking birds of prey for banding, Bird-Banding (Charles B. Floyd, 95 South St., Boston, Mass., 50 cents a copy), 8(4), Oct. 1937, pp. 156-161, 2 photos.

Modifications of steel or jump traps and of method of attaching them to poles so as to prevent injury to birds getting in them. Suggestions as to the use of live and dead bait. Experience in use of traps and discussion of further improvements.

WILDLIFE RESEARCH AND MANAGEMENT LEAFLETS

Issues of interest to wildlife managers additional to those previously mentioned are listed below. Copies of these mimeographed leaflets can be obtained from the Biological Survey, U. S. Department of Agriculture, Washington, D. C.

BS-103. Facts about snakes, 9 pp., February 1938.

The suggestions as to snake-proofing buildings and as to eradicating snakes by the use of poisonous gases and other means may be of interest to wildlife managers. Other topics treated are snake myths, and general habits and economic value of the animals.

BS-104. The status of wildlife research: 1937, by W. L. McAtee, 30 pp., February 1938.

Summary of research projects by Federal, State, and other agencies including the number of projects and synopsis of them according to subjects.

BS-105. The Federal aid to wildlife restoration act, by Albert M. Day, 4 pp., February 1938.

Fundamental provisions of the act which obviously is directed toward restoration of natural environment. Explanation of appropriations authorized. Functions of the Biological Survey in administering the law. Kind of projects likely to receive approval. Responsibility of the States for maintenance. Prospective benefits.

SPECIAL ARTICLE

Wildlife research programs

Some of the statements about wildlife research used in the preparation of Leaflet BS-104 (The status of wildlife research: 1937, 30 pp., 1938) are of such an interesting or representative nature that they may well be reproduced in full. Because the programs of the Federal-State cooperative units receive publicity in other media, reports on them are not included here. Again for reasons previously stated (WILDLIFE REVIEW, No. 6, November 1936, p. 2), fisheries investigations are not described. Aside from these stipulations, selection has been guided chiefly by illustrative value of the statements and it is hoped will be deemed in no way invidious.

The accounts are presented in the same order that their summaries appeared in Leaflet BS-104, and under similar headings.

RESEARCH BY THE BIOLOGICAL SURVEY AND COOPERATORS

Other State Institutions

Minnesota.-"The Minnesota Wildlife Disease Investigation, a cooperative project of the University of Minnesota, the Minnesota State Department of Conservation, and the Bureau of Biological Survey, maintained at the University of Minnesota under the direction of Dr. Robert G. Green, is this year completing a ten-year study of diseases of small game birds and mammals. In this study particular attention has been given to disease in relation to the decimation of "cyclic" species, ticks in relation to disease, the prevention of lead poisoning in waterfowl, and diseases of fur-bearing animals.

"Ticks and tick-borne diseases have not proved to be of great importance in cyclic variations of different species. Heavy infestations of ticks have a disastrous effect upon young animals but do not affect adults to a great extent. Tularemia plays a considerable part in deaths of cottontail rabbits but in grouse and snowshoe hares finds relatively resistant hosts. Rabbit papillomatosis has been found to be experimentally transmissible by the rabbit tick.

"The disease which is responsible for the periodic die-off of snowshoe hares has been recognized by its effect in reducing blood sugar to fatal levels and has been called shock disease. This discovery would seem to be the major accomplishment of the Investigation.

"The presence of such diseases as pseudotuberculosis, ulcerative enteritis, bird malaria, tuberculosis, rabbit papillomatosis, a malaria-like disease caused by leucocytozoa, an apparently new infectious disease caused by a diphtheroid bacterium, and botulism, have been studied among various species of animals and birds. Attention has been given to both ecto- and endo-parasitic infestations of different host species in relation to other mortality factors. The discovery and study of a well established colony of tick parasites in Minnesota are also worthy of mention.

"A lead-magnesium alloy shot has been developed which disintegrates in water and which, if ingested, is nontoxic for ducks. It is certain that, if this shot alone were used for duck shooting, the present disastrous epizootics of lead poisoning would eventually be alleviated and finally disappear.

"It is planned to continue the investigation with the intention of applying and practising the methods which have been discovered and developed. In the new ten-year program special attention will be given to the problem of the grouse cycle and to the etiology of shock disease." (Robert G. Green, Medical School, University of Minnesota, Sept. 20, 1937.)

RESEARCH BY FEDERAL BUREAUS OTHER THAN THE BIOLOGICAL SURVEY

Department of Agriculture

Bureau of Animal Industry.--"For more than 40 years the Bureau of Animal Industry has been accumulating information on the parasites of wild animals, including birds, in order to determine, among other things, what parasites of wildlife might be transmitted to livestock and poultry. As a result of this activity one of the largest parasite collections to be found anywhere in the world has been built up in the Zoological Division of that Bureau. This Division maintains also a catalogue of the world's literature on parasitology, one of the sections being devoted to parasites reported from various wild animals. Since the creation of the Zoological Division several hundred papers and notes dealing with the parasites of wildlife have been published, about 200 of these appearing during the past 10 years. These papers cover taxonomic investigations, descriptions of new species, distribution records, as well as life history investigations, particularly of those species parasitic in ruminants and in such important game birds as grouse and quail.

"During the past several years special interest has been centered around the general subject of the interrelationship of parasites of wild and domestic animals. As a result of this investigation, it appears that many of the parasites of ruminants, including such important forms as stomach worms, small intestinal trichostrongyles, lungworms, liver flukes, and rumen flukes, which are common and occasion extensive losses in livestock, occur also in deer, elk, moose, bison, and related wild animals. Exact information as to the losses among wild ruminants resulting from infestations with these parasites is for the most part lacking. In such cases as have been adequately investigated, however, it appears that parasites may and do cause extensive loss whenever conditions are favorable for their propagation. It has been shown also that wild waterfowl as well as upland game birds harbor parasites that are transmissible to domestic fowl.

"Whether or not wild mammals and birds, particularly those closely related to domestic species, obtained their parasite burden from domestic forms or *vice versa* is a debatable point and one for which evidence on either side is notably lacking. In the case of several parasites, particularly the large American liver fluke, *Fascioloides magna*, and of several species of small intestinal trichostrongyles of wild ruminants, the available evidence indicates that these forms are normal parasites of these animals and have

been transmitted to domestic ruminants. On the other hand there are some species parasitic in wild ruminants which were apparently acquired from their domestic relatives." (J. R. Mohler, Chief of Bureau, Sept. 25, 1937.)

Bureau of Entomology and Plant Quarantine.--"Recognizing the need for exerting every effort to conserve the fast diminishing numbers of valuable wild birds and mammals, the Bureau of Entomology and Plant Quarantine has for a number of years carried on studies incidental to other projects to determine the role of insect parasites in depleting our wildlife resources.

"For the past quarter of a century scientists of the Bureau have given consideration to the study of mites, lice, fleas, ticks, screwworms, and other arthropod parasites which often inflict heavy losses, either by their direct attack or by the transmission of disease, among wild animals. A great deal of information has been accumulated relative to the species involved, their life histories, distribution, and habits, and these data will eventually provide a substantial basis for the development of feasible control measures when the importance of conserving the wild fauna of this country receives the recognition it so rightly deserves. Cooperation is desired of bird lovers, sportsmen, and others in the collection of specimens of insect enemies of wildlife and information on deleterious effects of these pests.

"Another problem to which the Bureau is giving particular attention at this time is the destruction of quail in some of the southern States by fire ants. In some seasons these insects have been known to kill about 15% of the chicks before they leave the nest. Even the most effective control measures, intensively applied, have failed to reduce the mortality caused by these insect pests below about 5%. Investigations are under way to develop more efficient and practical methods for the control of the ants, and although some progress has been made, the situation is one which will require the best the entomologist and biologist have to offer.

"The interest of entomologists in the preservation of wildlife is well illustrated in their work on mosquito larvicides. Finding that the use of heavy oil as a means of destroying mosquito larvae in many instances was injurious to various species of aquatic animals and some of their plant foods, Federal and State investigators set about developing a material which was equally as effective in mosquito control as oil but which did not possess its objectionable qualities. As a result of this work, pyrethrum larvicide which is harmless to plants or animals was discovered. Further work of this nature involving the relation of insect control to wildlife is being carried on.

"During the past few years there has developed an increased interest in and urgent necessity for the control of disease-carrying and pestiferous mosquitoes near centers of large populations, resorting places, and even in rural districts. Mosquitoes breed in enormous numbers in salt marshes, ponds, and swampy areas. These places are also often the principal nesting, feeding and resting grounds for economically important waterfowl and fur-bearing animals. In an effort to free communities from annoyance and the health-hazard of mosquitoes, Federal, State, and local agencies have taken extensive steps to eliminate these mosquito-breeding areas by ditching, the most prac-

tical method of accomplishing this end. Unfortunately, such operations have in some instances seriously disturbed the favorite natural habitats of wildlife and may eventually prove distinctly deleterious to it.

"The Bureau of Entomology and Plant Quarantine, in cooperation with the Bureau of Biological Survey, is studying the important subject of mosquito-control in order to determine methods of effectively destroying these pests and at the same time cause little or no disturbance of natural wildlife conditions.

"The control of mosquitoes and the conservation of wildlife are important problems and the close relationship between the two demands full support and cooperation of the exponents of both if the former is to be satisfactorily solved and the best interests of wildlife preservation served.

"Widespread fall and winter burning of bunch grass, uncultivated areas, and edges of woodlands was formerly recommended for the control of chinch bugs. One of the reasons this recommendation is no longer made is the fact that the practice resulted in extensive destruction of game cover and nesting sites, and of the food of small game animals and beneficial birds. Another reason for discontinuing the recommendation of burning for the control of chinch bugs was the tendency of the farmers to apply it indiscriminately to woodland areas where comparatively few of the bugs normally hibernate and where serious injury to new forest growth resulted. It should perhaps be stated, however, that the main reason for abandonment of burning for control of this insect is its ineffectiveness and impracticability throughout much of the area concerned.

"Incidental to the extensive grasshopper control campaigns of recent years, it has been determined by the Bureau of Biological Survey that practically no injury to wildlife has resulted from the widespread use of arsenical baits where these baits have been scattered thinly in accordance with the recommendations and not left in lumps or piles. Although no definite data are at hand, it also seems very probable that the large-scale destruction of grasshoppers has been a material factor in preserving vegetation used as food and cover by wildlife.

"Preliminary investigation for the control of insect outbreaks on food plants utilized by wildlife has been undertaken in a few instances. Some study was made of an insect destroying wild rice in the Lake States and of the destruction of cat-tails on the marsh lands of Maryland. Wild rice is an important food for ducks and the roots of cat-tails are staple diet for muskrats. A few years ago the widespread defoliation of Ceanothus and other shrubs by tent caterpillars in Oregon and California was found to be greatly restricting the amount of browse available for deer and other grazing animals." (Avery S. Hoyt, Acting Chief of Bureau, Oct. 4, 1937.)

Farm Security Administration (Region II, Michigan, Wisconsin, and Minnesota).--"In planning and prosecuting our development work on the projects and in getting data for the wildlife management plans which we were instructed to prepare for each project, it was apparent that much information had to be obtained concerning the more important wildlife species, their numbers,

environment and trends in these particular areas. In the case of the Woodland Caribou, the Moose, the Sandhill Crane, the Snowshoe Rabbit and some other species, it appeared desirable to make some rather intensive studies. The project areas and our activities on them offered unusual opportunities for conducting such work. We, therefore, selected as project game managers some well qualified men and assigned appropriate investigative work to each of them in addition to his regular responsibilities in the development work.

"I am listing some of the subjects on which we have accumulated a good deal of information. Reports on some of these appear worthy of being published. All of them, and some of our forestry reports also, we find to be of value in preparing our rough drafts of the management plans for the project areas. Study of: Woodland Caribou in northwestern Minnesota with reference to its environment, habits, and food; Moose in northwestern Minnesota with reference to its environment, habits, and food; Sandhill Crane in central Wisconsin; 'Snowshoe Rabbit' (Varying Hare) in northwestern Minnesota; Prairie Chicken and Sharp-tailed Grouse in central Wisconsin; nesting, central Wisconsin game projects; Pinnated and Sharp-tailed Grouse booming grounds; new flowage areas above our dams to determine changes occurring in animal and plant life, central Wisconsin; improved trout streams to determine effectiveness of the various methods of treatment of the streams, central Wisconsin. Reports on: Trapping and banding programs, central Wisconsin and northwestern Minnesota; Ruffed Grouse survey, central Wisconsin game projects; Quail study, central Wisconsin game projects; Horned Owl food habits study in central Wisconsin game projects; Deer studies, central Wisconsin game projects and Beltrami project, Minnesota; banding of Varying Hare in northwestern Minnesota; fur inventories; food patch plantings; experimental fallow plots, central Wisconsin game projects; wildlife winter feeding; proposed food patch system, central Wisconsin game projects; planting programs; experimental plantings; aquatic planting, Beltrami project, Minnesota; phenological tables; plant collection, central Wisconsin game project; wildlife consus work--various projects in Michigan, Wisconsin, and Minnesota; biological reconnaissance; transfer of Beavers, Beltrami project, Minnesota; stream improvement work; public use of project areas--game, fish, fur.

"Most of our activities in wildlife matters have been directed toward actual development of the areas. Large scale environmental improvements have been made for the more important species. Through the construction of numerous dams and dikes in carefully selected locations, water and marsh areas have been formed aggregating between 250,000 and 300,000 acres. Some of these areas are designed chiefly for waterfowl, some for muskrats and beavers, and some as big game wallows. Some long belts of marsh were formed along the border of projects to prevent fires from entering the project areas. Such marshes, of course, serve also as nesting grounds for ducks and as habitat for beavers and muskrats.

"A good deal of attention has been given to food and cover plantings in all the projects, the aggregate of such plantations being quite large.

"In our forestry work as much consideration has been given to the improvement of wildlife conditions as to the betterment of the forest itself. This, I think, is fully justified. We have attempted to 'break up' extensive uniform stands and to avoid making large plantations of any one species. Irregular strips of grass land and brush are left between the plantations. Thickets of White Pine and White Spruce are being established by planting these in large areas of good deer browse." (W. T. Cox, Regional Forester-Biologist, Sept. 25, 1937.)

Other Departments

National Park Service.--"Following is a list including, I believe, all of our important projects: (1) A study of bighorn sickness and reasons for the decline in population in portions of Glacier National Park, Montana. Dr. Richard M. Bond spent a number of weeks on this problem during last winter and will continue the study if trouble recurs; (2) The effects on wildlife of forest spraying with arsenate of lead by the use of auto-giro or ground machinery. J. O. Stevenson and Allen Frost; (3) Economic bearing of the food habits of coyotes at Lava Beds National Monument, California. Joseph S. Dixon and Richard M. Bond; (4) Coyote food habits. Study to discover the ecological status of the species in natural areas. Dr. Adolph Murie. This study was begun in May, 1937 and is expected to be about 80 percent completed by May, 1938; (5) General wilderness wildlife problems in the High Sierras of California, from Sequoia to Yosemite National Parks. E. Lowell Sumner, Jr.; (6) Trumpeter swan nesting studies, Yellowstone National Park. Rangers and naturalists of the park staff; (7) Range studies with reference to wildlife problems are being carried on in Grand Canyon, Rocky Mountain, and Yellowstone National Parks by members of the parks' staffs and by wildlife technicians. The most thorough investigation is the study of the northern Yellowstone elk winter range by Ranger Rudolph Grimm and of the food of the elk and bighorn of Rocky Mountain National Park by Park Ranger Merlin K. Potts; (8) A plant survey of Great Smoky Mountains National Park by Dr. H. M. Jennison. Field work completed; (9) A historical study of beavers in Virginia to determine the former economic status and the possibilities of reintroduction. William J. Howard; (10) A study of the effects of artificial lakes on wildlife possibilities. William J. Howard; (11) Studies of the fauna of the Big Bend National Park Project. A. E. Borell of the National Park Service, and herpetologists from the Field Museum and University of Michigan; (12) Study of the effects of stream improvement work in State parks and Recreational Demonstration Projects in New England. Maynard S. Johnson." (Victor H. Cahalane, Acting Chief, Wildlife Division, Oct. 1, 1937.)

RESEARCH BY STATE CONSERVATION DEPARTMENTS

Illinois.--The State Natural History Survey Division has the responsibility of developing the wildlife-research program. Its report on projects involving birds and mammals is as follows:

"Urbana Township game management area. A three-square-mile game management demonstration area is being developed in Urbana Township, Champaign

County. Several small unpastured areas were planted to cover-producing shrubs by the Survey in the spring of 1937. Some of the land owners planted grain feed patches. One survey member who lives on the area reared 25 pheasants and the Conservation Department furnished 10 quail to liberate in the fall of 1937. The area is to be conducted as a laboratory for demonstration and experiment in game management.

"Analysis of trappers' reports rendered to the Department of Conservation. The purpose of this project is to determine (1) centers of abundance and scarcity of each species of fur-bearer, (2) changes of abundance in such centers, and (3) monetary income resulting from sale of raw pelts.

"Food patch experiments. Four mixtures of cultivated grains and another mixture which has been used for two years by the state sportsmen's clubs were planted in experimental plots in central and northern Illinois in the spring of 1937 to obtain data on mixtures best suited for use of wildlife in Illinois. Planting of six grain sorghums was also made on strip mine banks near Danville. Colby No. 10 milo and Cheyenne sorghum were the only ones that produced any seed on the strip mine soil.

"Cover planting experiments. About 20 kinds of wild and cultivated shrubs were planted in 1937 in experimental plots on the University farm to study their suitability for wildlife.

"Food habits of the quail. In addition to field observations, quail stomachs for analysis are collected from hunters and saved from birds taken for parasite studies.

"Food habits of the ring-necked pheasant. About 25 pheasant stomachs were collected from hunters during the hunting season of 1936.

"Life history and management of the prairie chicken. Prairie chickens occur locally in fair numbers in seven or eight gray silt loam prairie counties in south-central Illinois. Although their range is spotty, apparently there has been no serious loss of range in recent years. The prairie chicken study was begun in Jasper County in the summer of 1935 to secure facts for use in prairie chicken management. Nesting studies were made during the summers of 1935 and 1936. Population studies have been conducted since the summer of 1935. The Natural History Survey is cooperating with the Illinois Audubon Society in developing plans for one or more prairie chicken sanctuaries in the northern part of the state.

"Quail population study. We have conducted a quail census on a 2,560-acre study area in Jasper County in September, January, and March each year since 1935, to obtain data on the behavior of quail populations in one of our good hunting areas. We also obtained some records on nesting during 1935-36.

"Pheasant study. Since thousands of dollars are spent annually by the State and by sportsmen's organizations for pheasant propagation, it seems advisable to collect information on the ecology of Illinois pheasants. We

will, however, use material from studies that have already been conducted in adjoining states as far as possible. We conducted nesting studies in Champaign County in 1937 and have made observations on the local distribution of pheasants in this county at various times since early in 1937.

"Hungarian partridge population study. The Michigan Department of Conservation and the Illinois State Natural History Survey are cooperating in an annual January census of Hungarian partridges on a three-section study area in Lenawee County, Michigan. We have January counts for 1931, 1932, 1935, 1936, and 1937. It is hoped to conduct this January census over several years and to publish records on fluctuations of the partridge populations in this area.

"Census of waterfowl. Waterfowl numbers are estimated at intervals in autumn each year on Jack Lake near Bath, Illinois. These records will be analyzed from time to time to determine the relative numbers of each species and whether the numbers recorded are an index of waterfowl abundance in this region.

"Survey of parasites and diseases of fur-bearers. Viscera of about 40 fur-bearers obtained from trappers were examined in the fall of 1936. This project includes cooperation with the U. S. Biological Survey in post mortem examination of fur-bearers from the Federal Chautauqua Lake Sanctuary at Havana.

"Census of fur-bearers. Records of fur-bearers found on night field trips in which hunting dogs are used were compiled during the past winter and are to be obtained in succeeding winters.

"Survey of parasites of waterfowl. Duck viscera that are obtained from hunters or which come into the Survey from various sources are examined for parasites. This project includes cooperation with the U. S. Biological Survey in examination of crippled or sick waterfowl in the Illinois River.

"Studies of parasites of the prairie chicken. About 30 young and adult prairie chickens were collected during the summers of 1936 and 1937 and examined for parasites and diseases. This investigation was reported on briefly at the 1937 Midwest Wildlife Conference. The project supplements the prairie chicken study.

"Survey of parasites and diseases of the ring-necked pheasant and quail.

"Geographical distribution of the small mammals of Illinois. This project was begun in 1932 and includes compilation of distribution records on all non-fur and non-game mammals.

"Study of insect and bird relationships in the vicinity of shrub and grass areas. This is a cooperative project between the Sections of Economic Entomology and Game Management and Research of the Survey. It involves population counts of both insects and birds in the vicinity of hedges, grassland, and other cover areas, and attempted correlations between numbers of insects and insect-eating birds. Field work was begun in August, 1937.

"Survey of Illinois plants useful as food for game birds and animals. The purpose of this project is to develop a general knowledge of the occurrence, distribution, and general abundance of plants important as food in Illinois to birds and mammals." (Ralph E. Yeatter, Game Specialist, Nov. 18, 1937.)

Michigan.--The report on research activities of the considerable staff of the Game Division of the State Department of Conservation was presented in detail and in outline. Only the last is here reproduced.

"Farm-Game: Correlation of farm management and game management practices; Experimental food patch plantings; Correlation between pheasant populations and soil fertility; Methods of regulating hunting pressure in small game territory; Methods for promoting cooperation between hunters and farmers; Effects of controlled hunting methods on game supply.

"Upland Game Birds: Studies of ruffed grouse--Census methods, nesting, brood mortality, cover requirements, disease studies, food habits, cover improvements. Prairie chicken and sharp-tailed grouse--Propagation, diseases, food habits, trapping and banding, range and distribution.

"Waterfowl: Banding, food habits, diseases and parasites.

"Big Game: Moose--Studies of overpopulation and overbrowsing on Isle Royale, live-trapping and removal of moose from the island to the mainland, food, life history. Deer--Deer population: Live-trapping and tagging to determine age, home range, summer and winter ranges, drifts, migrations; deer census drives, sex ratio, dead deer counts, antler age criteria. Deer habitat: Inventories of summer and winter range, records of winter weather conditions. Deer hunting conditions. Food and cover management: Planting, release cuttings, controlled burning, controlled feeding experiments.

"Small Game: Cottontail rabbits--Life history: Range of individuals, population, sustained hunting yield. Food patch plantings; breeding habits; cover. Fox squirrels--Life history: Population and habitat distribution, sexual rhythm, nesting habits.

"Fur Bearers: Beaver--Population and life history study of beavers, size distribution of the beaver taken during the open hunting seasons, sex ratio of trapped beaver, gestation data from trapped beaver, quality of the furs taken from beaver trapped during the open season, damage to beaver pelts resulting from fighting. Skunk--Life history: Breeding habits and gestation period, population, food habits and nest predation.

"Predators: Ecological studies of wolves, coyotes, red foxes, bobcats, and otters, including--Relative populations; cruising ranges; food habits: analysis of stomachs, scats, and left over food items; tracking to determine nature and extent of forays.

"Ecological Studies (Cottontail rabbit, fox squirrel, skunk, ringneck pheasant, and bobwhite quail): Population, breeding habits, food habits, use of cover, plant habitats and food resources, winter food patches.

"Pathological Examinations: Yearly checks on disease incidence in ruffed grouse, sharp-tailed grouse, prairie chicken, and white-tailed deer; wildlife cycles; life histories of certain parasites of game animals and birds: Zygocotyle lunatum (a caecal fluke of ducks and shore birds), Amphimerus elongatus (pancreas and liver fluke of waterfowl), Oxyspirura

petrowi (eye worm of ruffed grouse, prairie chicken, and sharp-tailed grouse), Protostrongylus coburni (lungworm of deer), Hasstilesia tricolor (intestinal fluke of cottontail rabbits); pathological and biochemical studies in connection with experimental feeding of white-tailed deer; incidental work on various game species in relation to population changes of a non-cyclic nature, i.e. starvation, poisons, etc.

"Miscellaneous: Studies in developing cutting specifications under which commercial loggers may be permitted to log state-owned, over-mature deeryarding areas with the object of increasing the natural food supply; reconnaissance of large areas of submarginal land to determine the desirability of game cover, subsequent acquisition and management; ground cover.

"Wildlife Experiment Station: Life history, habits, management, and propagation of economically important birds and mammals; habitats including farm land, river-bottom woods, marsh, and upland scrub oak."
(H. D. Ruhl, In Charge, Game Division, Oct. 1, 1937.)

New York.-"In compiling a summary of the research activities with respect to game for the Conservation Department of this State, it seems most logical to take up the items in accordance with the different species or projects to which they are particularly related.

"Ruffed Grouse: For the past seven years a survey of the status and life history of this species in New York State has been in progress and is being continued. The purpose of the investigation has been to evaluate the various factors affecting the normal life history of this species, to discover if possible which of these are involved in local and in cyclic fluctuations, and to develop management practices by which environment may be improved. Field work has been conducted on over 10,000 acres divided mainly among four areas representative of the primary types of environment in this State. The work has been both intensive and comprehensive. The following nine major factors affecting the species have been studied in detail and correlated: Shelter, food and water, general habits, weather, enemies, man, diseases and parasites, reproductive capacity, and the practicability of artificial propagation.

"Some idea of the scope of this program may be gained from the following facts: Over 7,000 man-days have been spent in field research, about a quarter of which have been devoted to the statistical tabulation and analysis of the data recorded on form sheets in connection with the observation of 19,619 adult grouse flushes, 1,515 grouse brood flushes, 1,288 grouse nests, over 1,000 grouse drumming logs, and 702 grouse found dead; about 4,000 man-days have been spent in investigating the practicability of artificial propagation during the course of which 1,202 grouse have been hand-raised to maturity. Among the more important problems studied during this time are:

"Shelter--Detailed analysis of habitat composition; determination of seasonal shelter preferences and their relation to varying weather conditions.

"Food and Water--Determination of food preferences through the analysis of 346 adult grouse stomach contents, representative of the whole State during each season of the year; and of 206 grouse chick stomach contents, representative of the whole State; Comprehensive determination on typical

sample plots in each type of cover on areas representative of both woodlot and forest range of the insect life available to chicks during June of 1936, and on the former type in 1937.

"General Habits --Notation of a large amount of data as to the behavior of the birds themselves under various conditions as a means of evaluating the significance of this behavior in the life history of the grouse.

"Weather--Notations insofar as possible of effect of various weather conditions experienced during investigation; Detailed analysis of the U. S. Weather Bureau records from the Albany and Ithaca stations since 1890, in an attempt to correlate changes in these conditions with fluctuations in grouse abundance.

"Enemies--Study of the food habits of predatory birds and mammals in New York State through the analysis of a large number of stomach contents, pellets, and droppings; Detailed studies of the way in which important predators kill grouse and eat their eggs, as a means of diagnosing remains of individuals found dead and of identifying the predators responsible for nest destruction.

"Man--Determination of the effect on grouse populations of normal hunting pressure; Experimental studies of the effect of breaking up extensive tracts of uniform cover types.

"Diseases and Parasites--Continuous checking of the possibility that disease or parasitism may become important, by the annual examinations of about 200 adults and 150 chicks, representative of all parts of the State and of each season.

"Reproductive Capacity--Determination of sex ratio on each area each year, and of the proportion of birds breeding; Yearly comparisons of the average number of eggs laid, their fertility, their hatchability, and the viability of the chicks; Determination of mortality from all causes during each life period; Determination of population fluctuations on each major study area as of April and September, based on detailed 100% censuses; Experiments with respect to the productivity of different degrees of population density in relation to carrying capacity of the covert.

"Practicability of Artificial Propagation--Evaluation of all known techniques with respect to all phases of artificial propagation; Determination of the rapidity with which hand-reared grouse revert to the wild when liberated.

"Unclassified--Investigation of the physiological reactions of grouse, especially with respect to the effect of various light conditions on the breeding cycle; Compilation of a comprehensive annotated bibliography of the available literature relating to grouse in accordance with the various factors affecting the abundance of the species.

"Ring-necked Pheasants: Research with respect to pheasants has had three primary aims. The first has been to develop more economical methods of artificial propagation and distribution. The second has been the study of

the occurrence and significance of winter starvation and to determine the most practical way of alleviating it. The third has been to check the occurrence of disease and parasitism, both in captivity and in the wild.

"Studies of incubation and the determination of optimum feed rations have been carried on at Cornell University for four years under a cooperative arrangement between the Conservation Department and the State College of Agriculture. In all, 17,300 pheasant eggs have been devoted to the incubation study, while in the feed ration development, about 7,000 birds were utilized in preliminary experiments and 9,000 in subsequent checking. In addition, at the Experimental Game Farm, extensive experiments with brooding equipment have been made as compared with the range method as used on several of the other farms.

"In the starvation study, in addition to personally investigating many of the instances reported, many tons of grain have been distributed with the aid of interested sportsmen. Furthermore, 28 food patch mixtures comprising 39 species have been tested in four different soil types in the State.

"Subjects on which work is anticipated in the future include: Study of relative survival of liberated birds with respect to age and to origin, as to whether brooder or range reared, as a basis for future policy; Evaluation of possible need for liberating a higher proportion of male birds; Determination of relative nutritive value of various grains comprising recommended feed mixtures; Study of the effect of variations in light conditions on the breeding cycle.

"Quail: The principal research with relation to this species has been a determination of the success of restocking these birds in the 44 counties of the State where they formerly occurred. The method used has been to stock the best coverts of each of these counties over a four-year period, and then check results by means of a survey during the breeding season. Incubation studies, in which 7,300 quail eggs were utilized, have also been carried on in cooperation with the State Agricultural College at Cornell.

"Ducks: With respect to ducks, four main projects have received attention. Attempts are being made to develop a strain of wild black ducks which will breed satisfactorily in captivity. Also to develop a cross between the wild black duck and the so-called 'Flanders' duck, which will possess the wildness of the black and the breeding potential of the 'Flanders'. If successful, such strains will be used to build up the breeding stock of this species in suitable areas over the State. A third project has been to test the value of spring liberations of farm-raised mallards on suitable wild sites as a means of building up local breeding stocks of this species. Still another project has been to determine the most effective age at which to liberate young mallards. In this work, over 1,700 adult and 1,500 young ducks have been used.

"White-tailed Deer: Over the past six years a detailed study has been carried on as to the significance of the various factors affecting deer on their wintering grounds, with especial reference to the Adirondack region. The program comprised laboratory work at Cornell in cooperation with the

State College of Agriculture, experiments with captive deer under natural conditions, and field work on one of the most important wintering grounds in the Adirondacks. Approximately 500 man-days have been spent in field work, and 300 man-days in laboratory study, and about 30 individual deer have been studied.

"Among the more important problems studied during this time may be noted: A detailed study of the preferences of deer for various species of browse which comprise their winter diet in this State, to aid in evaluating winter range; A laboratory study of the nutritive requirements, including a comparison with domestic forms to establish a base line for further nutritional work; Development of a very palatable and highly nutritious food cake for emergency use; Investigation of the factors involved in the annual winter loss, and determination of the most important 'hunger belts' as well as characteristics of the range in general; Study of the effectiveness of artificial feeding with various materials, with special attention to the new concentrated cake, and the requirements for a satisfactory material for remote areas; Observations of the effect of different weather conditions on deer during the winter; Determination of the need for open water during the winter; Determination of the occurrence of diseases and parasites; Notation of a considerable amount of data as to the daily range, habits, movements, and cover preferences of deer on their wintering grounds.

"Factors which will receive attention as rapidly as possible include: More detailed analysis of existing range conditions as a basis for zoning the State with respect to management of deer; Determination of population densities, sex ratio, fawn production and time and characteristics of the rutting season, as a basis for future management policy; Evaluation of the carrying capacity of different types of range and correlation of these with other factors; Determination of the relative chemical composition and nutritive quality of important browse foods growing on different soil types; Investigation of the effect of hunting on herd composition and productivity, and correlation with population densities and range carrying capacity.

"With respect to future study of this species, it is hoped that it will be possible to increase the scope of the work to include the complete life history.

"Rabbits: Little research has been done with regard to this species, except for the pathological examination of both wild and imported specimens. However, it is becoming increasingly important that a study be made of the value of liberating imported stock.

"Pathological Examination of Game: For the past six years, a full-time Pathologist has been in the employ of this Department, whose job it has been to investigate the nature and occurrence of diseases and parasites among the wildlife of this State, including game, fur-bearers and predators. In addition to the study of these conditions in wild individuals, a fairly careful check has been kept of the situation on the various game farms. In the course of the work, over 4,000 individuals of wild game; 500 predators; and 13,000 specimens from game farms have been handled, representing over 20 different species." (Gardiner Bump, Superintendent, Bureau of Game, Oct. 28, 1937.)

Wisconsin.--Active projects at the State Experimental Game & Fur Farm, Poynette, are:

"Experimental Section--Propagation, crossing, experimental feeding, and stocking of black, cross, and gray raccoons; Experimental feeding and housing of red, cross, silver-black, and blue foxes; Experimental feeding and housing of Yukon and eastern minks; Propagation and stocking of untested exotic game birds, including the Reeves, Elliott, and Nepal Kalegge pheasants, and the Chukar partridge; Additional experiments include test plantings of the Formosan and Old English Blackneck pheasants, valley partridges, and wild turkeys; One of the principal research activities of the game farm has been the development of various types of electric brooders and continued experimentation in artificial incubation.

"General management--Experimental food patch planting with cooperative sportsmen's projects and on wildlife refuges; Establishment of experimental game food nursery producing 110 varieties of game food trees, shrubs, plants and vines at Wisconsin Rapids (distribution this fall will be approximately a half million trees, shrubs, and plants); Experimental bird banding of all game birds released on Wisconsin licensed shooting preserves; Cooperative grouse banding with the University of Wisconsin." (H. W. MacKenzie, Conservation Director, Oct. 4, 1937.)

(To be continued)

NOTES AND NEWS

Cooperative Wildlife Research.--Investigations for improving methods of managing wildlife on forests and farms and other biological studies will be undertaken at a new wildlife research unit being established at State College, Pa., by the Pennsylvania State College, the State Game Commission, and the U. S. Biological Survey. A cooperative agreement of the three agencies for setting up and maintaining the research unit was recently approved by the Secretary of Agriculture. Pennsylvania is the 11th State to enter into a cooperative agreement with the Biological Survey for investigating ways and means of fitting wildlife resources into land-use programs. Forest and farm-game problems will receive equal attention at the new research unit. Dr. Logan J. Bennett, leader of the Iowa research unit at Ames since its establishment in September 1935, on March 1 assumed charge of the new work in Pennsylvania.

To succeed Dr. Bennett in Iowa, Thomas G. Scott, extension wildlife specialist, has been appointed. The Iowa unit was organized September 24, 1935, under a cooperative agreement by the State Conservation Commission, the Iowa State College, the American Wildlife Institute, and the U. S. Biological Survey. Wildlife being studied in the research projects include the ring-necked pheasant, bobwhite quail, waterfowl, cottontail rabbit, raccoon, muskrat, and skunk. As a specialist in wildlife conservation for the Iowa State Extension Service since October 1935, Mr. Scott has helped advance the program for wildlife improvement on Iowa farms. He also is the author of several bulletins on birds and mammals, his most recent being "Mammals of Iowa." Mr. Scott received his B.S. and M.S. degrees from Iowa State College, where he has completed work toward a Ph. D. degree.

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